

# **Appendix M.     Blasting Plan**



# **Draft Blasting Plan**



FERC Docket No. CP09-54-000

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## **1. Scope of Blasting Project**

Blasting will take place along the Ruby Pipeline Project right-of-way. Ruby Pipeline, LLC plans to blast only in the areas where the rock cannot be economically excavated by conventional means. It is anticipated that this may occur anywhere along the right-of-way.

## **2. Types of Blasting**

Primary type of blasting will be for ditch excavation. Blasting may also be required during the right-of-way grading operation. The type of explosive used in blasting will be determined by the geotechnical strength of the underlying rock. Types of explosives are discussed in Section 5.

If any streams and wetland areas require blasting to perform the ditch excavation, the streams and wetland areas will be tested for rock and shot by the mainline trenching crew, except when not specifically possible due to timing completion requirements.

## **3. Location of Shots and Proximity to Existing Facilities**

No blasting will occur within 10 feet of existing pipelines or other structures. All blasting located along adjacent power line rights-of-way shall be conducted in a manner that will not cause damage to the power company property and facilities. The blast area will be backfilled or covered by blasting mats and/or other material as needed to protect nearby existing facilities, structures, highways, railroads or significant natural resources from thrown rock fragments.

## **4. Method to be Used to Minimize Hole-to-Hole Propagation**

Hole-to-hole propagation problems are not anticipated with the proposed product and pattern for the following reasons:

- Only cartridge explosives will be used; and
- The amount of explosives per borehole will be limited by the proximity of existing structures and utilities.

## **5. Types of Explosives / Initiation System to be Used**

### **Dyno Nobel Unimax® (or equivalent)**

An extra gelatin dynamite with a specific gravity of 1.51 and a detonation rate of 19,600 feet per second (unconfined). The cartridge size will generally be 2" x 8" (1.25 lbs/cartridge) or 2" x 16" (2.50 lbs/cartridge).

### **Dyno Nobel Unigel® (or equivalent)**

A semi-gelatin dynamite with a specific gravity of 1.30 and a detonation rate of 14,200 feet per second (unconfined). The cartridge size will generally be 2" x 8" (1.15 lbs/cartridge) or 2" x 16" (2.30 lbs/cartridge).

### **Dyno Nobel D-Gel® 1000 (or equivalent)**

A desensitized dynamite to be used in water blasting, if necessary, with a specific gravity of 1.36 and a detonation rate of 18,000 feet per second (unconfined). The cartridge size will generally be 2" x 8" (1.25 lbs/cartridge) or 2" x 16" (2.50 lbs/cartridge).

**Dyno Nobel Dynamax Pro™ (or equivalent)**

A propagation resistant dynamite, with a specific gravity of 1.45 and a detonation rate of 19,700 feet per second (unconfined). The cartridge size will generally be 2" x 8" (1.225lbs/cartridge) or 2" x 16" (2.45lbs/cartridge).

**Dyno Nobel NONEL® (or equivalent)**

17 or 25 Millisecond Delay Connectors or Dyno Nobel NONEL EZ Det® (nonelectric) 25/350 or 25/500 or 25/700 millisecond delay.

**Special 40-Grain Dyno Nobel Detonating Cord (or equivalent)**

With a detonation velocity of approximately 23,000 feet per second will be used as down hole and trunk lines.

**Dyno Nobel NONEL Nonelectric Shock Tube System Detonator (or equivalent)**

This will initiate all shots. This NONEL will be attached at one point only for initiation of the entire shot and will not be used for down hole priming.

**6. Drill and Blast Pattern**

The drilling program will be based on 2 rows of 2-1/2 inch diameter holes drilled with a grid spacing of approximately 3 feet by 5 feet along the ditch line. The drill pattern will be established using a powder factor of about 3.0-4.0 pounds per cubic yard to achieve the desired explosive energy ratio needed to break the rock and pull the ditch. This shot pattern may be adjusted on a site-specific basis to compensate for different geology, nearby structures, utilities or other sensitive areas.

**7. Charge Weight and Delays**

Delays will be used accordingly to control the vibration as well as limiting the transmission of energy below the damaging levels at any existing structure. The delay pattern will be created to provide the energy relief immediately down the ditch in preference to a horizontal direction. The main type of delays will be NONEL® MS-25, 17ms or 42ms which are color-coded for easy identification of delay length. The amount of dynamite used in each hole will be limited to the manufacturer's recommendations and specifications. We will also use down hole delays where they are needed to meet specifications on maximum pounds per delay allowed.

**8. Flyrock Control Plan**

All shots will be carefully designed by the Licensed Blaster to control flyrock. All hole loading activity will be supervised by the Licensed Blaster. The Licensed Blaster will communicate with the drillers to obtain geological information for each shot. Matting and/or padding will be utilized at the discretion of the Licensed Blaster.

A good quality, non-bridging stemming material that completely fills any voids in the drill hole will also be used to reduce the amount of flyrock. A minus 3/8" crushed rock will be used. This stemming size has been a standard for U.S. Corps of Engineers for decades.

**9. Selection of Blasting Products and Methods**

Ruby Pipeline, LLC has chosen this completely nonelectric system (including initiation) for several important reasons:



Due to the proximity of the high voltage power lines, stray current may be an issue that could result in the premature firing of an electric detonator.

The numerous radio equipped trucks belonging to all personnel (surveyors, inspectors and other subcontractors) on the project mandate that all shots be totally nonelectric to eliminate accidental detonation of electric caps. Furthermore, there may be other commercial and/or non-commercial radio users in the area not associated with the project (logging operations, quarry sites, etc.) who could compromise the safety of the blasting operations.

Nonelectric detonator shock tube systems work instantaneously (like electric blasting caps). This allows for precise and reliable initiation of shots in congested areas, adjacent to highways or in other locations where blast initiation control is an issue. Unlike electric blasting caps, nonelectric detonator shock tube systems are unaffected by extraneous electric currents from known and/or unknown sources.

## **10. Monitoring, Reporting and Controlling Ground Cracking and Displacement**

It is not expected that this type of rock will fracture in such a way as to cause any kind of ground displacement. Following each blast, the area will be examined for signs of ground cracking. Any indication of overbreak (cracks greater than half the distance to the existing pipeline) will be brought to the attention of the blaster and noted on the blast report. The shot pattern and/or loading will be adjusted to minimize or eliminate overbreak.

## **11. Explosives Storage and Transportation Procedures**

Explosives storage and transportation will be outlined in the Safety Program and will follow the guidelines from the WY, UT, NV, OR Code of Regulations and ATF-Explosives Law and Regulations.

## **12. Peak Particle Velocity Monitoring and Control**

Each blast will be monitored by a licensed blaster or other person experienced in monitoring blasts using a seismograph machine. The seismograph will be placed at the "point of interest". In most cases, this will be next to the foundation of the closest building, power line foundation, utility or well. In all cases, both the sensor and seismograph will be protected from flyrock.

This recorder gives a direct peak particle velocity (PPV) reading that is indicated on a tape as well as decibel reading to capture sound levels.

After each blast, a blast report will be compiled and the peak particle velocity at the point of interest will be recorded.

The industry standard for many years has been 12 inches per second maximum PPV on any underground structures. Ruby Pipeline, LLC expects peak particle velocities to be six inches per second or lower on any underground structures and 1.5 inches per second or lower on wells and above ground structures.

## **13. Fire Prevention**

Following the required waiting period after each shot, the blast area will be inspected for any indication of fire or fire hazard. Particular attention will be paid to the vegetated areas outside of the right-of-way. Normally, the explosives vaporize at the instant of detonation and there is no fiber or other material left to smolder or be a source of concern. Any plastic

shock tube from the initiation system that remains after the blast will be picked up for proper disposal immediately after the blast.

The blasting operation will generally take place after the grading operation has graded the right-of-way to bare mineral soil. The blaster shall ensure that the initiating detonator is placed on bare mineral soil and that there is no vegetation within a 20-foot radius.

The initiating detonator will be a minimum of 650 feet from the nearest loaded hole.

When fire danger is high due to forest conditions, a two-man fire watch team will patrol each blast area for a period of one hour after the required waiting period. The required waiting period shall be at least 5 minutes after the final shot in the blast area.

#### **14. Environmental Concerns**

All residents within 750 feet of the blast will be notified one day before the blast day. All residents within 50 feet of the blasting operation shall be given five days notice to evacuate their residence during the loading, and blasting and one hour following the blast. It is expected that all evacuated personnel could return to their homes by 6:00 pm.

All necessary measures will be taken to exclude livestock from the blasting area. During the normal safety check prior to blasting, the area will be checked for both livestock and wildlife. The blast will not be initiated until the area is clear.

For major stream crossings, Ruby Pipeline, LLC, shall comply with applicable Stream and Wildlife Construction and Mitigation Procedures and site-specific requirements. Mitigation measures for biological resources resulting from construction of the Ruby Pipeline Project are outlined in Section 5.0 of the Environmental Impact Statement, as well as in the following Plan of Development Appendices: Appendix I with regard to species-specific mitigation, Appendix S for greater sage-grouse and pygmy rabbit, Ruby's Reclamation Plans (Appendix E), Ruby's Upland, Erosion Control, Revegetation, and Maintenance Plan (Appendix D), and Ruby's Wetland and Waterbody Construction and Mitigation Procedures (Appendix F).

Blasting vibrations could potentially damage adjacent, undetected paleontological resources. However, field reconnaissance will be conducted in areas deemed significant prior to disturbing the ground surface, as described in Ruby's Paleontological Resources Monitoring Plan (Appendix H).

# **Attachment A Explosives Safety Program**



## 1. Federal and State Regulation

**Ruby Pipeline, LLC will follow all Federal and State regulations.**

Bureau of Alcohol, Tobacco and Firearms – 27CFR 181 (Commerce in Explosives).

Occupational Safety and Health Administration – 29CFR 1926.90 (Safety and Health Regulations for Construction Blasting and Use of Explosives).

Carriage by Public Highway – 49CFR 177 (self-explanatory).

Explosives and Blasting Agents – OSHA, 29CFR 1910.109 (Safety in the Workplace When Using Explosives).

**Guidelines to be Followed by Natural Gas Pipeline Companies in the Planning, Locating, Clearing and Maintenance of Right-of-Way and the Construction of Above Ground Facilities – 18CFR 2.69.**

### *General Regulations*

Only authorized and qualified personnel shall handle explosives and shall always be under the direct supervision of a blaster licensed, if required, by the state of WY, UT, NV, OR.

No flame, heat, radio transmitter or spark-producing device shall be permitted in or near explosives during handling, transport or use.

No person shall be allowed to handle, use or work in the area while under the influence of liquor, narcotic or dangerous drugs.

Explosives shall be accounted for at all times. Explosives not in use shall be kept in locked, approved storage magazines. A running inventory shall be maintained at all times. Appropriate authorities shall be notified of any loss, theft or unauthorized entry into a magazine.

No explosives shall be abandoned.

No fires shall be fought where contact with explosives is imminent. All personnel shall be cleared and area guarded against other intruders.

Separate Class I and II magazines shall be used for transport of detonators and explosives from magazine storage area to blast site. Magazines shall be kept locked except for removal of material for use. In addition, explosives will be loaded directly to each shot point from the magazines on approved ground transportation equipment.

When blasting in areas of congestion or in close proximity of other structures or services, special precaution will be taken to avoid damage or personal injury.

Every reasonable precaution shall be used to notify others of use of explosives (visual, audible, flags, barricades, etc.). No onlookers or unauthorized personnel will be permitted within 1000 feet during loading or blasting. Flaggers shall be stationed on roadways that pass through the danger zone to stop traffic during blasting operations.

All necessary precautions shall be taken to prevent accidental current discharge from any possible source. The exclusive use of a nonelectric initiation system will eliminate this possibility in nearly every situation with the possible exception of lightning strikes. A lightning detector will be used in all loading and shooting operations.

#### *Electrical storms*

All blasting operations shall be suspended and all persons shall be removed from the blasting areas during the approach and progress of an electrical storm. The following rules must be followed:

A lightning detector should be used to monitor the proximity of lightning to the shot. When the storm is 10 miles distant as identified by the lightning detector, notify all persons in the blasting crew of approaching storm. Stop all loading of holes and evacuate all personnel, except blaster and assistant, to a safe distance (1000 feet) from the blast area.

If the blast cannot be initiated before the storm arrives (within 10 miles as indicated by the lightning detector), the blaster and assistant shall evacuate the site to a safe distance.

Personnel may return to worksite when the storm has passed and is 10 miles distant as determined by the lightning detector or after the completion of blast which allows for inspection of site and/or misfire.

#### *Packing Material*

Empty packing material shall not be used again for any purpose. It shall be burned at an approved location. Typically, this will be in the excavated trench or other designated area.

#### *Blasting Supplies*

Damaged or deteriorated blasting supplies shall not be used. If discovered, the damaged or deteriorated blasting supplies will be returned to the supplier.

#### *Delivery and issue of explosives*

Delivery and issue of explosives shall only be under, by and to authorized persons and into authorized magazine or temporary storage handling areas.

#### *Blasting Operations*

Blasting operations shall not be carried out in the proximity of other utilities or property owners without prior approval. "ONE CALL" notification requirements shall be followed.

#### *Loading and Firing*

- All loading and firing shall be directed and supervised by a competent and experienced person.
- No loaded holes shall be left unattended or unprotected. No explosives or blasting agents shall be abandoned on the right-of-way. Explosives shall not be primed until immediately before use and shall not be allowed to lay overnight in drilled holes.

*Jurisdictional Authorities*

All jurisdictional authorities shall be granted unrestricted access to all explosive records as well as site access for procedural inspections. All personnel not involved with the current blasting operation must check in with the blaster before entering the blasting zone.

*Warning Signs*

Warning signs, indicating the blast area, shall be erected and maintained at all approaches to the blast area. Warning sign lettering shall be a minimum of four inches in height on a contrasting background. Warning signs shall comply with the requirements of the jurisdictional authorities.

- The warning signs (4" lettering) will be erected and maintained at all approaches to the blast area. Flaggers will be stationed on all roadways passing within 1,000 feet of the blast area and be responsible to stop all traffic during blasting operations. All personnel not involved in the actual blast shall stand back at least 1,000 feet and workers involved in the actual blast shall stand back 650 feet from the time the blast signal is given until the "All Clear" has been sounded. An audible blasting signal (air horn or siren) shall be used. The following blast signals will be used during blasting.
  - Warning Signal A one minute series of long horn or siren sounds will be made 5 minutes prior to the blast.
  - Blast Signal A series of short horn or siren sounds will be made one minute prior to the blast.
  - All Clear Signal A prolonged horn or siren sound following the inspection of the blast area.

*Nonelectric Initiation System*

All blasting will be performed with a nonelectric initiation system and shall follow standard industry guidelines in regard to use and safety.

*Blaster Qualifications*

Blaster qualifications shall meet all federal, state and local standards.

**Misfires**

If there are any misfires, all employees shall remain away from the suspected misfire area for at least 15 minutes. Misfires shall be handled under the direction of the person in charge of the blasting. All leads shall be carefully traced and a search made for unexploded charges.

- If a misfire is found, the blaster shall provide proper safeguards for excluding all employees from the danger zone.
- No other work shall be done except that necessary to remove the hazard of the misfire and only those employees necessary to do the work shall remain in the danger zone.
- No attempt shall be made to extract explosives from any charged or misfired hole! A new primer shall be inserted into the hole and the hole shall be reshot. If refiring of the misfired hole presents a hazard, the explosives may be removed by washing out with water or, where the misfire is underwater, blown out with air.
- No drilling, digging or picking shall be permitted until all missed holes have been detonated or the authorized representative has approved that work can proceed.
- Prior to the end of the working day, any misfires shall be located and rendered safe.

*Initiation*

Initiation will be accomplished using a NONEL (nonelectric) shock tube detonator or comparable product.



# **Attachment B**

## **42 FRD Examples**



US Pipeline- Ruby Pipeline- For use 40' and further from existing lines

Example 1- 2.5' Advance- 2112 Holes/mile

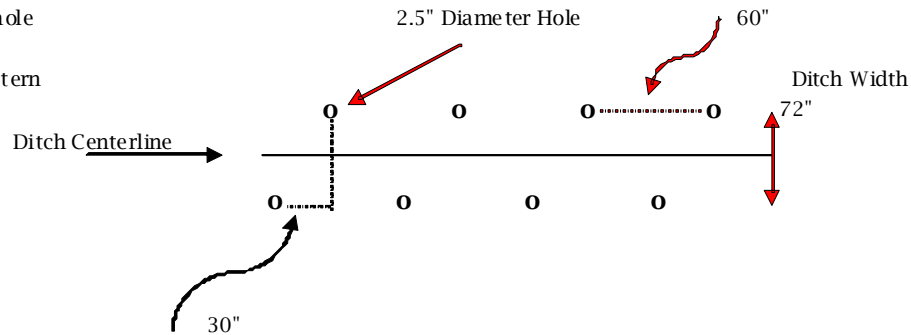
Full Rock Ditch

42" Pipe

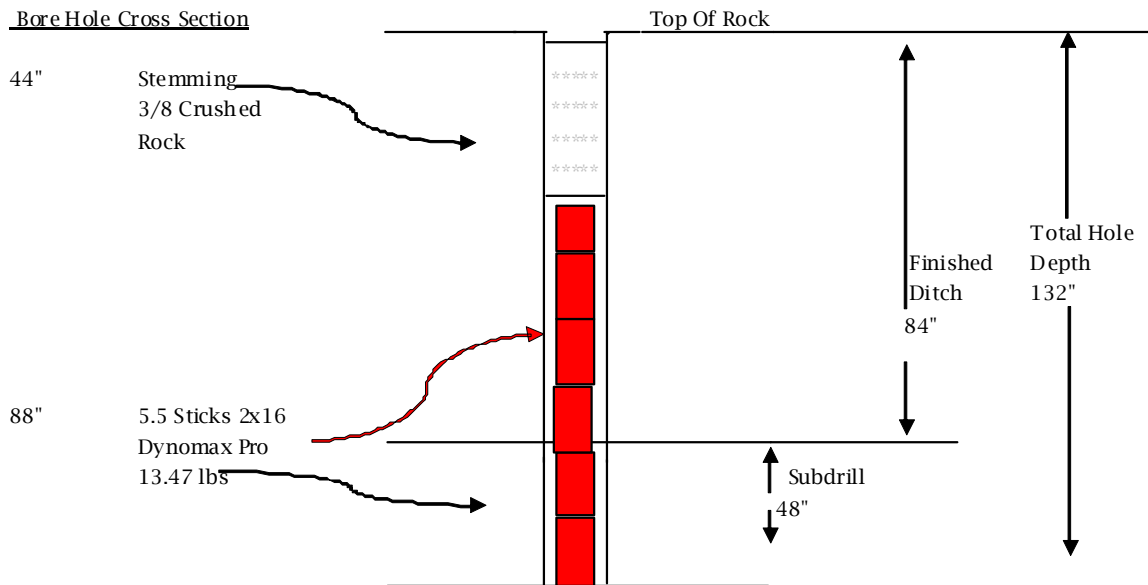
13.47 lbs/ delay

13.47 lbs/ hole

#1-Drill Pattern



Bore Hole Cross Section



Timing



= 25 milliseconds

The configuration below represents 1 hole per delay



Vibration Prediction is 3.50 in/sec ppv @ 40'

US Pipeline- Ruby Pipeline- For use 25' and further from the existing line

Example 2 - 2' Advance- 2640 holes/mile

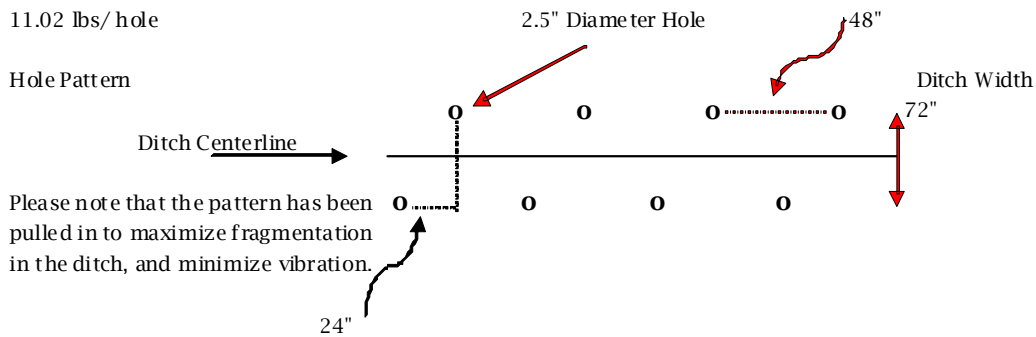
Full Rock Ditch

42" Pipe

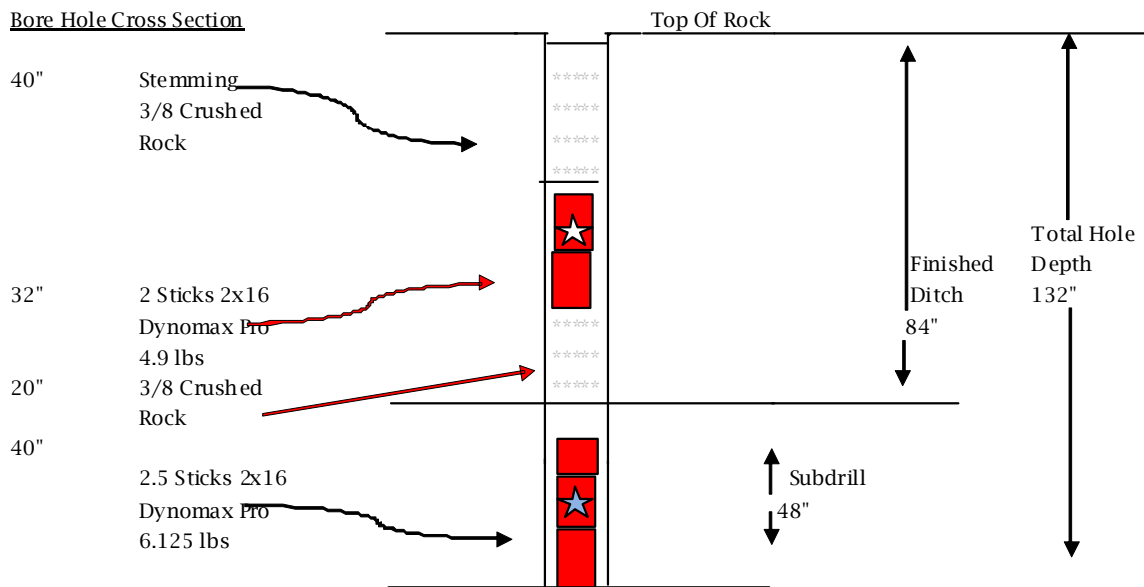
6.125 lbs/ delay

11.02 lbs/ hole

Hole Pattern



Bore Hole Cross Section



Timing

☆ = 25 milliseconds The configuration below represents 1/2 hole per delay



Vibration Prediction is 3.95 in/sec ppv @ 25'

US Pipeline- Ruby Pipeline- For use 10' -25' from an existing line

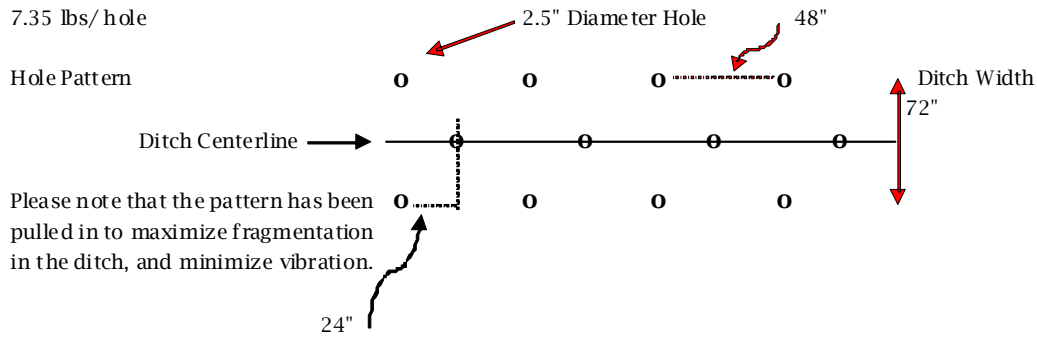
Example 3- Vibration Sensitive - 4' Advance- 3960 holes/mile

Full Rock Ditch

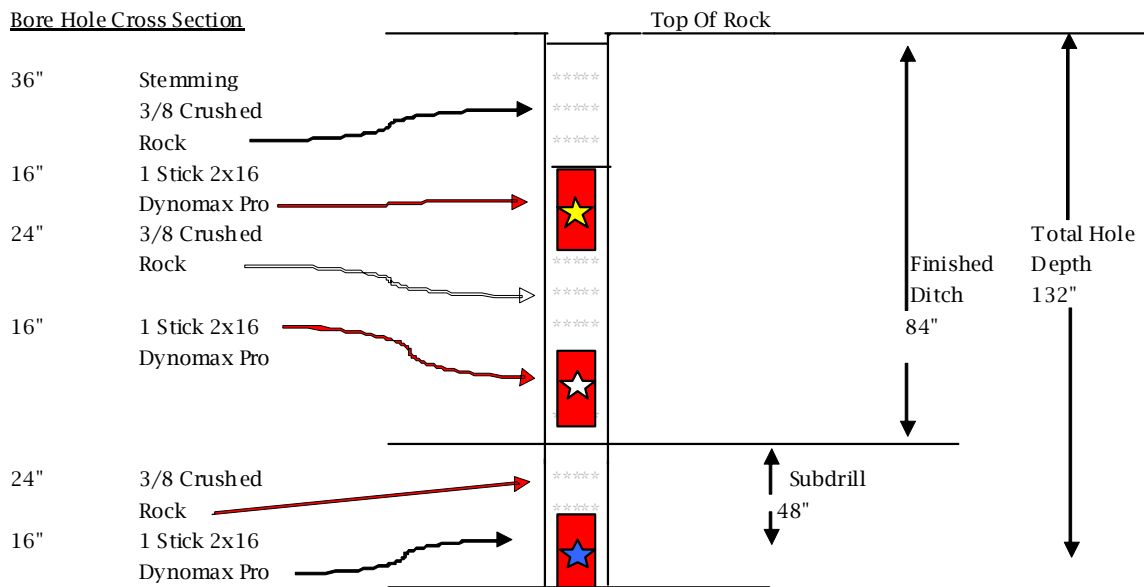
42" Pipe

2.45 lbs/ delay

7.35 lbs/ hole



#### Bore Hole Cross Section



#### Timing

☆ = 25 milliseconds

The configuration below represents 1/3 hole per delay



Vibration Prediction is 3.08 in/sec pppv @ 10'